IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
Supratik Guha et al.)
Serial No.: 10/699,399)
Group Art Unit: 2859)
Filed: October 30, 2003)
Examiner: Mirellys Jagan)
For: TRANSPARENT COOLING DUCT)
_____)

APPELLANT'S REPLY BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Examiner's Answer dated April 14, 2008, the two month due date for response to which is June 16, 2008 (the next business day after June 14, 2008), the Appellants hereby respectfully submit this reply brief in support of their appeal to the Board of Patent Appeals and Interferences of the Examiner's final rejection of claims 3-7, 9-10, 15-19, 21-22, 29, and 30 of the above-referenced application.

CERTIFICATE OF TRANSMISSION

In accordance with 37 CFR 1.8, I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted or submitted under electronics filing system to the U.S. Patent and Trademark Office on the date:

June 16, 2008 By: Jon Gibbons Signature: /Jon Gibbons/
Applicant, Assignee, or Representative)

RESPONSE TO EXAMINER'S ARGUMENTS

Independent Claims 7 and 19 Are Patentable Over Davidson In View Of Paniccia

The Examiner has taken the position that claims 7 and 19 are unpatentable over Davidson (US 6,140,141) in view of Paniccia (US 6,251,706), 35 U.S.C. §103(a). In response, Appellants respectfully traverse this rejection, and submit that Davidson, taken alone and/or in view of Paniccia does not disclose all the elements and limitations of the claimed invention. Consequently, the claims on file are patentable over Davidson, taken alone and/or in view of Paniccia, and the allowance of these claims is earnestly solicited.

Overview of Prior Art

Davidson discloses a system comprising a duct adapted to be coupled with an electronic device, wherein the electronic device forms one side of the duct; a coolant flowing through the duct so as to cool the electronic device; and a photon detector (radiation detector 145) located adjacent to the device for detecting photons emitted from the electronic device; wherein the duct and coolant are at least partially transparent to photons with wavelengths between about 0.1 micron to 20 microns; the coolant is either water or a perflourocarbon; the duct comprises a window of quartz or glass; and the device includes a protecting outer layer (is packaged) (see Figs 2 and 3; col 2, line 30 – col 3, line 2; and col 3, lines 39-49). On page 3 of the Office Action dated Dec. 4, 2006, the Examiner states "Davidson does not disclose the duct being made of at least one of polished silicon, quartz, sapphire, glass, and diamond ...".

Davidson is not directed towards a device for measuring thermal distributions of chips but for sensing voltages of signals on a chip. (Davidson, col. 3, lines 41-42.) In *Davidson*, the voltages are not measured by sensing infrared radiation but by sensing a polarization of light reflected back from the device (Col. 1, lines 25-29) or by measuring the intensity of near-infrared radiation (Col. 2, lines 58-60) emitted from the circuit. Near-infrared radiation has a defined range of wavelengths between 0.75 and 2.5 microns. Davidson discloses two materials that are used for the window: fused quartz,

and BK-7 glass. (Davidson, col. 3, lines 1-2). Davidson does not operate in the IR frequency range. (Davidson, col. 2, line 59). The two materials specifically called out by Davidson, namely fused quartz and BK-7 glass, are sufficient for the near-infrared radiation range that Davidson operates in. (Davidson, col. 4, lines 1 and 2.)

Paniccia discloses a system for testing an electronic device during operation by detecting photons (IR radiation) from the device through an IR-transparent window made of diamond, silicon, or sapphire that is coupled to the device. The material of the window is thermally conductive, and is chosen depending on the heat removal requirements of the device (see col 5, lines 51-65). A photon detector comprising an IR camera is located adjacent the device to detect the photons emitted by the device for use by its processor in generating a thermal map of the device under conditions for which the device is designed. Paniccia discloses that it is known in the art to determine the voltage levels of the device as well as thermal information of the device by detecting photon emissions from the device when testing the device at its operation capacity, and that the IR camera can determine the voltage levels of the device as well as thermal information. The thermal information allowing proper thermal regulation of the device to prevent thermal degradation (see Fig 7D, col 1, line 66 – col 2, line 9; col 2, lines 26-35 and 43-55; and col 7, lines 13-37). Paniccia discloses a window material that is transparent to IR wavelengths. Paniccia does not teach nor suggest the window being part of a cooling system that uses coolant flowing through a duct so as to cool an electronic device.

Cited References Fail To Describe All Limitations

Davidson taken alone and/or in view of Paniccia does not suggest, teach or mention a duct partially transparent to photons with wavelengths above 3.6 microns and made of at least one of polished silicon, quartz, sapphire, glass and diamond.

On page 3 of the Examiner's Answer, the Examiner states:

> *"wherein the duct and coolant are at least partially transparent to photons with wavelengths above 3.6 micros (greater or equal to 1 micron, see column 2, lines 58-60)."*

Appellants respectfully disagree. The Examiner is not quoting the entire sentence. The entire sentence of Davidson at column 2, lines 58-60 is reproduced below (emphasis added):

> *"To minimize the attenuation, the fluid 105 and window 110 may be made of material substantially transparent to near-infrared radiation (i.e. radiation having wavelengths about 1 um or more)."*

Further, on page 12, middle paragraph of the Examiner's Answer, the Examiner states

> *"Appellant's argument that Davidson measure the intensity of near-IR radiation, and discloses materials (fused quartz and BK-7 glass) for the window are that are not transparent to wavelength above 3.6 micros are not persuasive because Davidson states that the materials for the window are transparent to radiation having wavelength of about 1 micro or more (see column 2, lines 58-61), which includes the wavelength range claimed by the Appellant."*

Again, the Examiner selectively quotes Davidson by omitting the "near-infrared radiation" language. Davidson is concerned with near-infrared radiation, not infrared radiation as claimed in the present invention. Near-infrared radiation, as is known in the art, is well defined as a range of wavelengths between 0.75 and 2.5 microns. Davidson gives two possible materials that are used for the window 110. The materials are fused quartz and BK-7 glass. Davidson, col. 3, lines 1-2. Both fused quartz and BK-7 glass are inoperable for thermal imaging, because they are not transparent to wavelengths

above 2.5 microns.[1]

Appellants respectfully submit that the Examiner is mischaracterizing the teachings of Davidson. Davidson cannot be used for detection of infrared radiation (as opposed to near-infrared). Moreover, on page 2 of the June 26, 2006 Office Action, the Examiner states fused quartz is transparent to wavelengths up to 3.6 microns and BK7 glass is transparent in the range 0.25 to 2.9 microns. This is clearly outside the range claimed in independent claims 7 and 19 of "wavelengths above 3.6 microns". By the Examiner's own admission, fused quartz and BK-7 glass are inoperable for the thermal imaging of Appellant's invention above 3.6 microns. Further, in the last sentence of the penultimate paragraph of page 11 and the last line of the top paragraph page 12 of the Examiner's Answer, the Examiner states:

> *Instead, the rejection are based on replacing the material of Davidson's window with a material as taught by Paniccia, i.e. modifying Davidson in view of Paniccia."*

One would not be motivated to take the IR transparent window of Paniccia and place it in the liquid cooling duct of Davidson because the materials recited in Davidson for sensing polarization of light work well for their intended use, which is at lower wavelengths. Further, one would not be motivated to take the IR camera of Paniccia and use it to replace the polarization sensing device of Davidson, simply because Davidson would no longer be able to sense voltages through detection of light polarization. Not being able to sense voltages would not only destroy the intent of Davidson of sensing voltage through detection of light polarization, the resulting device would be completely inoperable to accomplish the teachings of Davidson. References that produce seemingly inoperative devices cannot serve as predicates for a *prima facie* case of obviousness.[2] **During the prosecution history of this case, Appellant**

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[1] For BK-7 Glass the "Useful Wavelength Range, Transmission (microns) 0.32-2.30" See for example http://www.harricksci.com/infoserver/Optical%20Materials/BK-7%20Glass.cfm and http://www.mellesgriot.com/products/optics/mp_3_1.htm and for fused quartz see at least http://www.mellesgriot.com/products/optics/mp_3_2.htm

[2] Just to be complete, the opposite is also true also i.e. if one were to take the glass of

amended the independent claims on appeal specifically to recite the "above 3.6 microns" limitation because the Examiner indicated that Davidson was inoperable at this level. See page 2 of Office Action dated June 26, 2006.[3] What is the motivation to combine these two references if the result to one skilled in this art is readily inoperable?

Further, Appellants submitted a Declaration under 37 C.F.R. §1.132 from Dr. Emanuel Tutuc, a researcher at IBM who is familiar with infrared radiation along with the corresponding general wavelength of transmission of two groups of materials: i) fused quartz and B-K glass and ii) polished silicon, quartz, sapphire, glass, and diamond. The Declaration of Dr. Tutuc supports Appellant's argument that fused quartz and BK-7 glass are inoperable for thermal imaging above 4 microns. Appellants also have previously submitted in the Reply Brief printouts of three (3) websites providing data on wavelength transmissions through BK7 glass and fused quartz.

The Examiner states on page 5 of the Examiner's Answer that

> Referring to claim 7, it would be obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclose by Davidson by replacing the window with a window taught by Paniccia, in order to provide a window having a desired thermal conductivity to remove heat depending on the heat removal requirements of the particular application, and since the particular type of material used to make the window is only considered to be the use of a "preferred" or "optimum" material out a plurality of well known material out of a plurality of well known [...]

Appellants respectfully suggest that the Examiner is mischaracterizing the presently

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Paniccia and replace it with the glass of Davison, the IR detector of Paniccia would no longer function because IR wavelengths cannot pass through fused quartz or BK-7 glass.

[3] The wavelength ranges in the present case are analogous to amended pH ranges in Warner- Jenkinson Co. v. Hilton Davis Chem. Co., 117 S. Ct. 1040, 41 USPQ2d 1865 (1997). The Supreme Court noted that during prosecution of the '746 Patent, the claim was amended to add the phrase "at a pH from approximately 6.0 to 9.0". The upper limit was added to distinguish over a reference that disclosed an ultrafiltration process that was carried out at a pH above 9.0. Here the claimed wavelength has been amended to recite "wavelengths above 3.6 microns".

claimed invention. On page 5 and page 9 of the Examiner's Answer, the Examiner gives the reason to combine Davidson and Paniccia because "*in order to provide a window having a desired thermal conductivity to remove heat depending on the heat removal requirements.*" However, the present invention uses liquid over a chip surface and measures the thermal distributions on the chip through the liquid coolant. under operating conditions. The measurement of the thermal distributions is intention of the present invention, not the selection of materials for heat removal as suggested by the Examiner. The coolant liquid removes the heat unlike the teachings of Paniccia where no coolant is used. In contrast, the Appellants' device provides proper measurement of a thermal distribution through use of a photon detector to see through the upper surface of the duct and through the fluid to the back surface of the chip throughout the entire infrared frequency range. The infrared frequency range includes wavelengths between 2.6 microns to 20 microns. The materials (the duct and the coolant) were selected because these were at least partially transparent to photons with wavelengths above 3.6 microns not because ot there thermal characteristics as suggested by the Examiner. Since few materials are transparent at these wavelengths, Appellants claimed the use of polished silicon, quartz, sapphire, glass, and diamond because these materials are transparent to frequencies having wavelengths above 3.6 microns. Appellants respectfully submit that the Examiner has provided a completely erroneous motivation to combine the teachings of Davidson and Paniccia, and thereby fails to serve as a predicate for a *prima facie* case of obviousness. Accordingly, Appellants submit that the independent claims are allowable for at least this reason as well.

Conclusions

In view of the foregoing, it is respectfully submitted that the application and all of the pending claims are in condition for allowance. Reversal of the final rejection of independent claims 7 and 19 is respectfully requested. All the remaining claims i.e. claims 3-6, 9-10,15-18 and 21-22, 29 and 30 depend from claims 7 and 19, respectively, and will be allowable as well, which allowance is respectfully requested.

Respectfully submitted,

Dated: June 16, 2008

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